EFFECTIVE METHODS

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A METHOD FOR HARDENING RAPIDLY WEARING PARTS

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A new method for extending the service life of rapidly wearing parts of presses made of grade U8 tool steel is considered. Results of hardening are discussed.

A weak spot in the service of molding press machines is the short service life of their lining. For instance, at Krasnyi Stroitel' Moscow Ceramics Factory the service life of a lining made of U8 tool steel is 3 days or less. After that, the press has to be stopped for lining replacement. Substantial material and labor resources are consumed in this way (a milling-machine operator is constantly engaged in making a lining). To extend the service life of the lining and, consequently, of the press and to improve the quality of manufactured articles, a combined method for passivation and hardening of steel and iron has been developed by the authors [1 – 3].

Passivation and hardening of rapidly wearing parts made of U8 steel makes it possible to increase their hardness, wear resistance, and corrosion resistance and impart antifriction properties to the diffusion layer.

Passivation and hardening of the lining and other press parts can be performed either at factories manufacturing presses or directly at ceramic factories.

The development of the method for metal and iron passivation was fostered by research carried out at the Institute of General and Inorganic Chemistry of the Academy of Sciences of the USSR (USSR Inventor's Certif. No. 1023162) [4], as a consequence of which AKhFS and MIKS compounds were developed, and by experimental works performed by the author [1 – 5]. AKhFS and MIKS agents are made by domestic producers according to TU 6-18-186–83. Their content in the solution of the passivating liquid is low (2 – 5 wt.%). The use of these agents in the passivating liquid is related to the fact that the diffusion layer formed on machine parts in heat treatment has improved hardness, anticorrosion, and antifriction parameters, like graphite. However, unlike graphite, this layer is not combustible, which is effected by phosphate-cementation of the surface of the metal in heat treatment.

The results of passivation and hardening of the lining of presses for molding ceramic articles are shown in Figs. 1 and 2. As can be seen, the hardness of the surface layer of U8 steel increases by 5 – 7 units on the Rockwell hardness scale. The same phenomenon is observed in cyanidation of metals [6]. However, the phosphate-cementation technology eliminates the toxic process of cyanidation.

The thickness of the lining layer having undergone passivation and heat treatment increases as the passivation

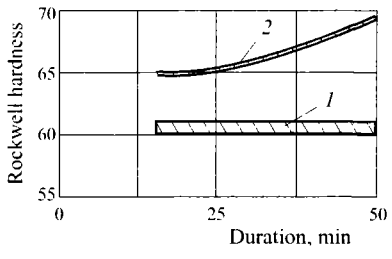

Fig. 1. Change in the hardness of the surface layer of tool steel U8 versus passivation duration: *1*) without passivation; *2*) with passivation.

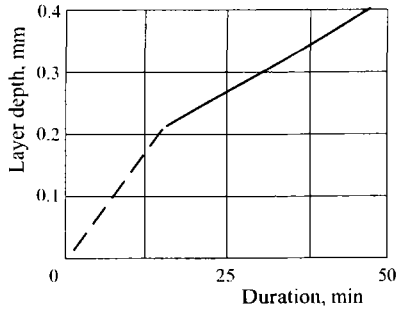

Fig. 2. Effect of the passivation duration of the depth of the phosphate-cement layer of U8 steel.

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TABLE 1

Passivation duration, min	Results of treating surface layer of machine parts	
	Rockwell hardness	depth, mm
15	65	0.22
30	66 – 67	0.30
50	67 – 68	0.42

duration increases, which points to increased service life of the hardened parts.

The technological parameters of passivation and hardening of U8 tool steel and the results of their application in a passivating liquid with a 4 – 5% content of AKhFS and MIKS compounds at a temperature of 60 – 65°C are shown in Table 1. The layer microstructure is martensite.

It is expedient to combine the processes of passivation and hardening of parts. Both processes in this case are performed on the same production line [2]. This makes it possible, on the one hand, to mechanize and automate the whole treatment process, and on the other hand, to prevent contamination of industrial sewage with the passivating-liquid reactants.

The process of passivation and hardening of metals, alloys, and cast irons is widely accepted in machine-building and machine-tool factories and in the construction industry.

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